ABSTRACT

A highly transparent non-metallic cathode is disclosed that comprises a metal-doped organic electron injection layer that is in direct contact with a transparent non-metallic electron injecting cathode layer, such as indium tin oxide (ITO), wherein the metal-doped organic electron injection layer also functions as an exciton blocking or hole blocking layer. The metal-doped organic electron injection layer is created by diffusing an ultra-thin layer of about 5-10 Å of a highly electropositive metal such as Li throughout the layer. A representative embodiment of the highly transparent non-metallic cathode comprises a layer of ITO, a layer of 2,9-dimethyl-4,7-diphenyl-1,10-phenanthroline (BCP), which acts as an electron injection, exciton blocking, and hole blocking layer, and an ultra-thin layer of lithium, which degenerately dopes the layer of BCP, improving the electron injecting properties of the BCP layer. This cathode is demonstrated for use in an OLED having a transparency of about 90% or higher combined with a device external quantum efficiency of about 1% or higher.